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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/930,914	08/15/2001	Yoshihiro Yamaguchi	22837-06289	1691
758	7590	01/04/2005	EXAMINER	
FENWICK & WEST LLP SILICON VALLEY CENTER 801 CALIFORNIA STREET MOUNTAIN VIEW, CA 94041			FERRIS III, FRED O	
			ART UNIT	PAPER NUMBER
			2128	

DATE MAILED: 01/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/930,914

Applicant(s)

YAMAGUCHI ET AL.

Examiner

Fred Ferris

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/16/01.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. *Claims 1-15 have been presented for examination based on applicant's disclosure filed on 15 August 2004. Claims 1-15 have been rejected by the examiner.*

### **Priority**

2. *Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d) based on application 2000-268316 filed in Japan on 5 September 2000. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.*

### **Specification**

3. *The apparent attempt to incorporate subject matter into this application by reference to "Michalewicz, Z. Genetic Algorithm + Data Structures = Evolution Programs, Third, Revised and Extended Edition, 1996, Springer-Verlga is improper because the document has not been properly included in the Information Disclosure Statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.*

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

***4. Claims 1-15 are rejected under 35 U.S.C. 101 because the claimed invention is drawn to non-statutory subject matter.***

*Specifically, claims 1-5 are not technologically embodied and merely recite “shape designing” that could be carried out by a combination of paper and pencil calculations and using mathematical abstract ideas. Claims 6-15 are directed to a “program” and “medium” that is intended to execute the method for the same limitations as claim 1 (i.e. using mathematical abstract ideas). The Examiner further submits that Applicant’s have not recited any limitations that provide a tangible result and have merely claimed a manipulation of abstract ideas realized as mathematical constructs. Section 2106 [R-2] (Patentable Subject Matter — Computer-Related Inventions) of the MPEP recites the following:*

*“In practical terms, claims define nonstatutory processes if they:*  
*– consist solely of mathematical operations without some claimed practical application (i.e., executing a “mathematical algorithm”); or*  
*– simply manipulate abstract ideas, e.g., a bid (Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.”*

*An invention which is eligible for patenting under 35 U.S.C. § 101 is in the “useful arts” when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a “useful,*

**concrete and tangible result.”** The test for practical application as applied by the examiner involves the determination of the following factors:

(1) “Useful” - The Supreme Court in *Diamond v. Diehr* requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to determine whether the asserted utility is accomplished.

(2) “Tangible” - Applying *In re Warmerdam*, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. § 101. In *Warmerdam* the abstract idea of a data structure became capable of producing a useful result when it was fixed in a tangible medium which enabled its functionality to be realized.

(3) “Concrete” - Another consideration is whether the invention produces a “concrete” result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. § 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.

The Examiner respectfully submits, under current PTO practice, that the claimed invention does not recite either a useful, concrete, or tangible result and is merely drawn to a manipulation of abstract ideas.

- The invention is not **useful** since independent claims 1, 6, and 11 do not recite a result that is useful in the technological art. This makes it difficult to determine Applicant’s invention since it merely claims a manipulation of abstract ideas by optimizing objective functions and finding Pareto solutions. (The patent eligibility standard requires **significant functionality to be**

**present to satisfy the useful result aspect** of the practical application requirement. See *Arrhythmia*, 958 F.2d at 1057, 22 USPQ2d at 1036.)

- The claims are not **tangible** since, for example, the results of the “trade-off relationship between objection functions is undefined. No tangible result is recited as a result of the consideration of the “trade-off relationship between objection functions (see independent claims 1, 6, and 11).
- The claims are not **concrete** because the results are not assured. For example, is a solution possible for any and all arbitrary inputs? (i.e. any objective function?)

### **Claim Rejections - 35 USC § 102**

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**5. Claims 1, 5, 6, 10, 11, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by “An Updated Survey of GA-Based Multiobjective Optimization Techniques”, C.A. Coello, ACM Computing Surveys, Vol. 32, No. 2, June 2000.**

**Per independent claims 1, 6, and 11:** Coello discloses the use of optimized objective functions (page 110, section 2.0, Fig. 2, 6) in optimization analysis where the optimization analysis is performed on objective functions using Pareto optimization (page 112, sections 2.2-2.3, Figs. 2, 3) inclusive of a Pareto solution found by trade-of

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*relationships (page 119, column 2, paragraph 2, page 116, footnote 2) between the objective functions. More importantly, Coello discloses the use of MOGA techniques and Pareto ranking in the design of turbine compressor blade shapes (page 133, column 1, line 1) as performed by Obayashi in 1997 (page 132, column 2, paragraph 4). Further, as noted by applicants on page 12, line 8 of the specification, "incidence toughness can be evaluated using any of the parameters which are evaluated in CFD calculations", and would therefore be inherent in the design of compressor blade shapes as disclosed page 132, column 2, paragraph 4, page 133, column 1, paragraph 1. Hence, Coello explicitly or inherently teaches all of the claimed limitations of independent claims 1, 6, and 11. Claims 6 and 11 merely claim the computer program and medium for the same limitations as claim 1 and are therefore rejected using the same reasoning as noted above.*

*Regarding dependent claims 5, 10, and 15: These claims merely claim the method, computer program, and medium for limitations relating to Pareto optimization by MOGA, which is clearly anticipated by Coello as previously cited above. (see: page 132, column 2, paragraph 4)*

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**6. Claims 2-4, 7-9, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over “An Updated Survey of GA-Based Multiobjective Optimization Techniques”, C.A. Coello, ACM Computing Surveys, Vol. 32, No. 2, June 2000 in view of “Aerodynamic and Aeroacoustic Optimization of Airfoils via a Parallel Genetic Algorithm”, B.R. Jones et al, AIAA 98-4811, 1998.**

*As previously cited above, Coello discloses the elements of the claimed limitations of independent claims 1, 6, and 11.*

*Coello does not explicitly disclose airfoil aerodynamic properties such as edge deviation angle, pressure coefficients, lift/drag ratios, Mach number, load, etc., as objective functions. (Although the examiner believes this would be inherently necessary in a Pareto ranked MOGA based blade shape design process such as taught by Coello.)*

*Per dependent claims 2, 7, and 12: These claims relate to realizing objective functions that include airfoil aerodynamic properties. Jones discloses objective functions that include airfoil aerodynamic properties such as deviation angel (angle of attack), lift/drag ratios (coefficients), pressure coefficients, and MACH number. (page 1 – nomenclature, page 3, column 2, paragraph 3 to page 5, paragraph 4, Fig. 5) Claims 7 and 12 merely claim the computer program and medium for the same limitations as claim 2 and are therefore rejected using the same reasoning.*

*It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Coello relating to optimized objective functions using Pareto optimization and trade-of relationships, with the*

*teachings of Jones relating to objective functions including airfoil aerodynamic properties, to realize the claimed invention. An obvious motivation exists since, in this case, the Coello reference teaches to the Jones reference, and the Jones reference teaches to the Coello reference. Specifically, both Coello and Jones teach optimizing blade design by Pareto optimization of objective functions and are used in the same technical arena as noted above. Coello teaches to Jones because Coello discloses that such methods have been used in compressor blade shape design (See: Coello, page 133, column 1, line 1). Jones teaches to Coello because Jones specifically discloses the optimization of airfoil (blade) aerodynamic properties using the Pareto optimization of objective function techniques. (See: Jones, pages 1-3) Further, the level of skill required by an artisan to realize the claimed limitations of the present invention is clearly established by both references. (See: Coello/Jones, Abstracts) Accordingly, a skilled artisan having access to the teachings of Coello and Jones, would have knowingly modified the teachings of Coello with the teachings of Jones (or visa versa) to realize the claimed elements of the present invention.*

*Per dependent claims 3, 8, 13: These claims relate to incidence toughness as parameters for evaluating the design shape obtained by opposites signs of incident angle. As noted above, page 12, line 8 of the specification indicates that the, "incidence toughness can be evaluated using any of the parameters which are evaluated in CFD calculations". Hence, this process would be inherent if Coello as noted above. Further, obtaining incidence angles with opposite signs with respect to the design point of an*

*incidence angle would be necessary to optimize the design for a particular design point incidence angle. (i.e. design choice) Jones also discloses optimizing by design point (Figs. 6, 7, page 9, paragraph 3) and specifically considers the geometric angle of attack (page 1, column 2, paragraph 1) and, hence, would have been obvious to a skilled artisan using the same reasoning and motivation as cited above. Claims 8 and 13 merely claim the computer program and medium for the same limitations as claim 3 and are therefore rejected using the same reasoning.*

*Per dependent claims 4, 9, and 14: These claims relate to the absolute value of incident angel being 10 degrees or less. Jones discloses a model including the geometric angle of attack (page 1, column 2, paragraph 1) that would inherently include the ability to model any real-world incident angle including absolute values of 10 degrees. (applicants indicate that the actual use considered realistic for incident angle is 10 degrees or less, see: page 13, line 1 of the specification) Hence, Jones would obviously model incident angles as 10 degrees or less in order to optimize the blade for actual real world conditions, and would have been knowingly incorporated by a skilled artisan using the same reasoning and motivation as cited above. Claims 9 and 14 merely claim the computer program and medium for the same limitations as claim 4 and are therefore rejected using the same reasoning.*

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**Conclusion**

7. *The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Careful consideration should be given prior to applicant's response to this Office Action.*

*U.S. Patent 6,606,612 issued to Rai et al teaches turbine blade design optimization.*

*"Multiobjective Optimization with Messy Genetic Algorithms", D.A. Van Veldhuizen et al, SAC 00', ACM 1-58113-239-5/00/003, ACM May 2000 teaches multiobjective optimization.*

*"Multidisciplinary Turbomachinery Blade Design Optimization", R. Dornberger et al, AIAA-2000-0838, AIAA 2000 teaches blade shape design using pareto optimization.*

*Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred Ferris whose telephone number is 571-272-3778 and whose normal working hours are 8:30am to 5:00pm Monday to Friday. Any inquiry of a general nature relating to the status of this application should be directed to the group receptionist whose telephone number is 571-272-3700. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jean Homere can be reached at 571-272-3780. The Official Fax Number is: (703) 872-9306*

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